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DESIGNS AND SPECIFICATIONS
of
STANDARD RAILWAY WATER TANKS

CANADIAN DES MOINES STEEL COMPANY, LIMITED





WE take pleasure in presenting this book to those interested in water storage on the Canadian Railroads. We have endeavored to collect and publish here such information as will be of practical value to railroad men.

This book deals only with Standard Practice. In case you have requirements calling for special or unusual design we will appreciate an opportunity to assist you. A card, telegram or 'phone call will bring one of our engineers to your office.

CANADIAN DES MOINES STEEL COMPANY
LIMITED



CANADIAN DES MOINES STEEL COMPANY, LIMITED



Four Post One Panel Railway Tank



CANADIAN DES MOINES STEEL COMPANY, LIMITED



Standard Cold Climate Tank

Showing Steel Encased, Tile Heating Chamber.





Sphericonical Type Railway Tank



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Four Post Two Panel Railway Tank



CANADIAN DES MOINES STEEL COMPANY, LIMITED



Six Post Two Panel Railway Tank



CANADIAN DES MOINES STEEL COMPANY, LIMITED



Three Panel Hemispherical Type with Riveted Steel Riser



CANADIAN DES MOINES STEEL COMPANY, LIMITED



Standpipe



CANADIAN DES MOINES STEEL COMPANY, LIMITED



Railway Coaling Station



CANADIAN DES MOINES STEEL COMPANY, LIMITED

Standard Specification
FOR A
Steel Railroad Water Tower

NUMBER W.S. 5



CANADIAN DES MOINES STEEL COMPANY
LIMITED
CHATHAM, ONTARIO

CANADIAN DES MOINES STEEL COMPANY, LIMITED

GENERAL

These specifications are accompanied by a plan or plans giving the capacity of the tank, the general dimensions of the structure, the size of the members, the thickness of the materials and other data; and also by a proposal or contract for the construction of the same. The contract, when properly signed, supersedes the proposal.

The plans and specifications are intended to co-operate, to explain and elucidate each other, and are equally binding upon the contractor for the tower. Any work called for by the plans and not mentioned in the specifications, or vice versa, shall be executed the same as though it were indicated in both the plans and specifications, subject, however, to any modifications indicated in the proposal or contract. In the event of any discrepancies between the plans, and the figures or writing upon them, the figures or writing shall be taken as correct, and in case there be any discrepancies between the plans, the specifications and the proposal or contract, the proposal or contract shall have precedence over either of the others. Figures or writing on the plans shall take precedence over the specifications, otherwise the specifications shall govern.

The foundations, including reinforcing steel when required, and the supply pipe shall be furnished by the purchaser unless otherwise stated in the proposal or contract. The anchor rods and detailed plans for the foundations shall be furnished by the contractor for the tower.

STRENGTH AND STABILITY

The structure shall be proportioned to withstand safely the following loads and forces:

1. The weight of the structure.
2. The weight of the water in the tank.
3. A horizontal wind pressure of thirty pounds per square foot over six-tenths of the vertical projection of the entire tank and roof, together with a horizontal wind pressure of not less than 50 pounds per column per vertical foot of tower, equivalent to a wind velocity of about 100 miles per hour. The wind pressure shall be considered as acting in such horizontal directions as will produce maximum stresses.

QUALITY OF MATERIAL

All steel in the structure shall be made in accordance with the specifications of the American Society for Testing Materials.

Structural Steel

Structural Steel and Tank Plates shall be made by the open-hearth process, and shall be of the grade known as Structural Steel for Bridges, Serial Designation: A7-16.

Maximum phosphorous, .04 per cent.

Tensile strength, 55,000 to 65,000 pounds per square inch.

Yield point not less than one-half the tensile strength.

Percentage of elongation, $\frac{1,500,000}{\text{tensile strength}}$.

Roof Plates

Roof plates may be made by the open-hearth or bessemer process. They shall be made of a grade suitable for the purpose and shall be free from laminations, cracks or other surface defects.

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Rivets

Rivets shall be made from open-hearth steel of the grade known as Rivet Steel, in accordance with Serial A7-16 Specification.

Maximum phosphorus, .04 per cent.

Tensile strength, 46,000 to 56,000 pounds per square inch.

Yield point not less than one-half the tensile strength.

Percentage of elongation, $\frac{1,500,000}{\text{tensile strength}}$

Bending test, 180 degrees flat on itself, without fracture on the outside of bent portion.

Tower Rods

Tower rods shall be made of rivet steel of a grade that may be welded, upset and threaded in a satisfactory manner.

Inspection of Material

If the purchaser desires to test and inspect the material, all such tests and inspection shall be made at the place of manufacture prior to shipment, and at the expense of the purchaser.

TANK

The tank shall be composed of plates of the thickness shown on the plan. Unless otherwise shown on plan it shall have a hemispherical bottom. In case the tank is constructed without a roof there shall be a heavy stiffening angle at the top of the shell.

When a steel roof is to be furnished it shall be securely connected to the top ring of the shell with angle clips and bolts.

Roof

The tank shall be covered with a roof of conical shape when indicated on plan. It shall be constructed of steel plates not less than $\frac{1}{8}$ of an inch in thickness, and shall be well painted and provided with a finial, scuttle hole and cover. When the conditions make some other kind of roof desirable, it may be constructed of a frame work of wood or steel with wood, composition or other covering. Unless definitely shown otherwise it shall be built of steel plates as above specified.

Riveting

All horizontal joints shall be single riveted lap joints. All vertical joints shall be single, double or triple riveted lap joints, as may be required to secure the proper efficiency. In work that requires calking the spacing of rivets shall not exceed ten times the thickness of the calked plate for single riveted joints, nor twelve times the thickness of calked plate for double or triple riveted joints.

Post Connections

The connections of the tank with the posts shall be made as shown on the plan, using a sufficient number of rivets to properly distribute the loads over the post sections and also over the shell of the tank.

Balcony

There shall be constructed around the bottom of the tank cylinder a horizontal steel plate girder of sufficient strength to withstand safely the horizontal shear and bending moments in-

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duced by the horizontal component of the stresses in inclined columns. This girder shall serve as the balcony floor and shall have a trussed steel railing around its outer edge. When the columns are vertical, or the capacity of the tank does not exceed 10,000 gallons, the balcony is omitted unless otherwise shown on the plans. An angle of proper size shall in such cases be substituted for the balcony.

TOWER

The tower supporting the tank shall be constructed as indicated on the plan, which shows the size of the columns, struts, sway rods and all principal members. Details not shown thereon shall be of sufficient size to conform to the established rules of good engineering practice, viz: They shall be capable of transmitting safely the stresses for which the members are proportioned.

Compression Members

All compression members shall be of the open type, to permit inspection and painting.

Column Splices

Main column splices shall be located as near as practicable to the intersection of the center lines of the columns with the center lines of the struts.

Splice plates shall be provided and shall be riveted so as to hold the members in line and transmit any tension or shear to which the member may be subjected.

Column Bases

Columns shall be securely riveted to the base plates. Column bases shall be made of steel plates and angles and shall be designed to distribute the load over the foundation cap stones.

Sway Rods

All tower sway rods shall be provided with means for adjusting the length and shall be upset where the threads are cut.

Pins and Pin Plates

All pins and pin plates shall be of sufficient size to develop the full strength of the rods.

Riser Rods

There shall be a set of round rods at the level of each set of struts and extending from each column to the front casing or riser pipe to brace the same. These rods shall be fitted for adjustment, but not upset unless so specified on plan. When the riser pipe is carried up inside of the tank for a considerable distance it shall be stayed in a similar way.

Anchor Rods

Anchor rods or bolts shall be provided for securing the bases of the tower columns to the foundations. These shall be of sufficient strength to anchor the tower against overturning by the wind. The tower contractor shall furnish the anchor rods F. O. B. cars at delivery point. They are to be set accurately into the concrete foundations by the foundation builder.

WORKMANSHIP

Joints in Main Columns

All tower columns shall have their abutting ends milled to secure a uniform bearing.

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Punching and Riveting

All rivet holes shall be accurately spaced and punched. The diameter of the punch shall not exceed by more than 1/16 of an inch the diameter of the rivets used. The diameter of the die shall not exceed the diameter of the punch by more than 1/16 of an inch. All riveting shall be done by experienced workmen.

Forming Tank Plates

The plates for the cylinder of the tank shall be formed cold by rolling to the proper curvature. The bottom plates shall be pressed to the necessary curvature without heating, pounding, or other means which would produce uneven stresses or weaken the metal.

Scarfing

The plates shall be carefully scarfed where required to make a water tight fit. No scarfing shall be done at a temperature below that of ignition of a hard wood hammer handle.

Calking

All the seams in the shell and bottom of tanks shall be made watertight by calking only. No foreign substance of any kind shall be put in the laps between such plates. Plates shall be calked on the side on which the rivet heads are formed.

LADDERS

Rigid Ladders

Horizontal lace bars shall be provided for a ladder on one column, when ten-inch channels or larger are used, to a point vertically below the outer edge of the balcony and from this point a substantial steel ladder shall extend to the balcony. Where a balcony is not used the horizontal lace bars above mentioned shall extend to top of column, and where smaller than ten inch channels are used an independent steel ladder shall extend from a point ten feet above foundations to the top of the tower. A ladder shall extend from the balcony to the top of the tank where access is had to the same by means of a scuttle through the roof. An inside steel ladder shall be provided from the scuttle to the tank bottom when indicated on the plan.

Revolving Ladder

For convenience in painting and inspecting the outside of the tank a substantial steel ladder pivoted to the cast iron finial at the apex of the roof, and revolving on the roof and side of tank, may be substituted for the rigid steel ladder on the outside of tank. This revolving ladder will be furnished only when indicated on the plan.

WALKWAY

When so indicated on the plan a steel walkway shall be furnished. This shall be a substantial steel platform with hand rail, extending from the ladder column to the riser pipe for convenience in inspecting.

PAINTING

Shop Paint

All work shall be covered before leaving the shop with one coat of black oxide of iron, graphite, or equally good paint thoroughly mixed with linseed oil, except the contiguous surfaces of the plates forming the tank, which surfaces shall not be painted. All other parts inaccessible after assembling must be well painted before assembling.

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Field Paint

After the work has been erected the whole structure, except inside of tank, shall be painted with one coat of graphite paint, and all parts not accessible for painting after erection shall be painted before. The inside of tank shall be given one coat of special damp-proof paint.

INDICATOR

When so stated in the proposal or contract an indicator will be furnished. It shall consist of a target sliding vertically in a channel over a graduated scale. It shall be operated by means of a line passing over two pulleys at the top of the tank and connected to a suitable float inside the tank.

EXPANSION JOINT

An expansion joint shall be furnished for connecting the riser pipe to the bottom of the tank except in case of short towers or where other provisions are made for expansion in the riser pipe.

SUPPLY PIPE

The supply pipe may be either steel or cast iron pipe of the diameter specified in proposal or contract. Cast iron pipe may have Bell and Spigot or Flanged joints. Steel pipe shall have flanged joints. The flanges in all cases shall be A. S. M. E. standard unless otherwise shown.

The materials for the supply pipe, including the base elbow, shall be furnished and erected by the purchaser unless otherwise stated in the proposal or contract.

FROST CASING

Where the climate is such as to necessitate the protection of the water in the supply pipe from freezing, a frost casing shall be provided. This casing shall be built of one or more thicknesses of lumber, with air spaces of about 2 inches between the casings, as shown on plan accompanying proposal. The outside course shall be $\frac{1}{8}$ inch matched and dressed lumber. This casing is designed to assist in preventing the water in the riser pipe from freezing. It does not avoid the necessity for keeping a circulation in the riser pipe during cold weather. A frost case is not furnished unless specified in the proposal or contract.

LARGE RISER PIPE

When so indicated on plan a large riveted steel riser pipe shall be furnished and erected by the tower contractor. This riser pipe shall be fitted with the necessary pipe connections, manhole and clean-out valve with operating mechanism for same. This will permit cleaning the tank without interrupting its service.

DELIVERY OF MATERIAL

Unless otherwise stated in proposal or contract, the tower contractor will unload and deliver the materials to the tower site provided it is within two miles of the railway station and the road is suitable for hauling.

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FOUNDATIONS

General

The tower contractor shall furnish plans for the foundations. These foundations shall be designed for bearing on good solid natural earth, clean dry sand, firm clay or other soil of equal bearing capacity.

The foundations will not be furnished by the tower contractor unless so stated in the proposal or contract.

If necessary, in order to obtain a firm footing or to get below the frost line, the excavation shall be carried deeper than shown on plans. When the tower contractor builds the foundations, and conditions are such as to require extra excavation, wet excavation, rock excavation or more material or labor than is called for on the plans, he shall be compensated for the additional work required.

Piers

The foundations shall consist of concrete piers with the necessary anchor holds. They shall be of sufficient weight to resist the uplift due to the wind forces. The column piers shall be built of such a batter that the center line of the column prolonged shall pass through the center of the pier at the bottom. Each pier shall be surmounted by a concrete cap stone.

The anchor rods shall be built into the piers at the exact positions and elevations shown on foundation plan. They shall be held firmly in position while pouring the concrete so that the weight of the concrete does not displace them.

Concrete

The concrete for that part of the piers below the cap stones shall be composed of one (1) part Portland cement, three (3) parts sand and five (5) parts broken stone or gravel. The cap stones shall be of concrete composed of one (1) part Portland cement, one and one-half ($1\frac{1}{2}$) parts sand and three (3) parts finely broken stone or gravel.

Portland Cement

The Portland cement shall be one of the best brands, fresh, finely ground and free of any foreign material.

Sand

The sand shall be coarse, sharp and clean, and free from clay or loam.

Broken Stone or Gravel

The broken stone or gravel shall be of good quality, and free from clay or other foreign material. That for the main portion of the pier shall be capable of passing through a two (2) inch ring; while that for the cap stones shall not be larger than one (1) inch in any dimension.

Mixing

The materials shall be thoroughly mixed and immediately deposited in the forms. No concrete that has been allowed to partially set shall be put in the foundations.

Concrete Cap Stones

The tops of concrete cap stones shall be troweled level and smooth and finished to exact level indicated on foundation plan.

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TEST

When the tank is ready to receive water the purchaser shall cause it to be filled promptly. Leaks shall be made tight by recalking. The entire work shall then be inspected and if it conforms to these plans and specifications and the contract it shall then be accepted and final settlement made. The purchaser shall furnish sufficient water for making the required tests promptly. If the purchaser is unable or neglects to fill the tank for test, he shall either instruct the contractor for the tower to have one man remain at the purchaser's expense to recalk if required, or the purchaser may elect to pay the traveling expenses if the man returns later to recalk or make necessary adjustments.

PAYMENTS

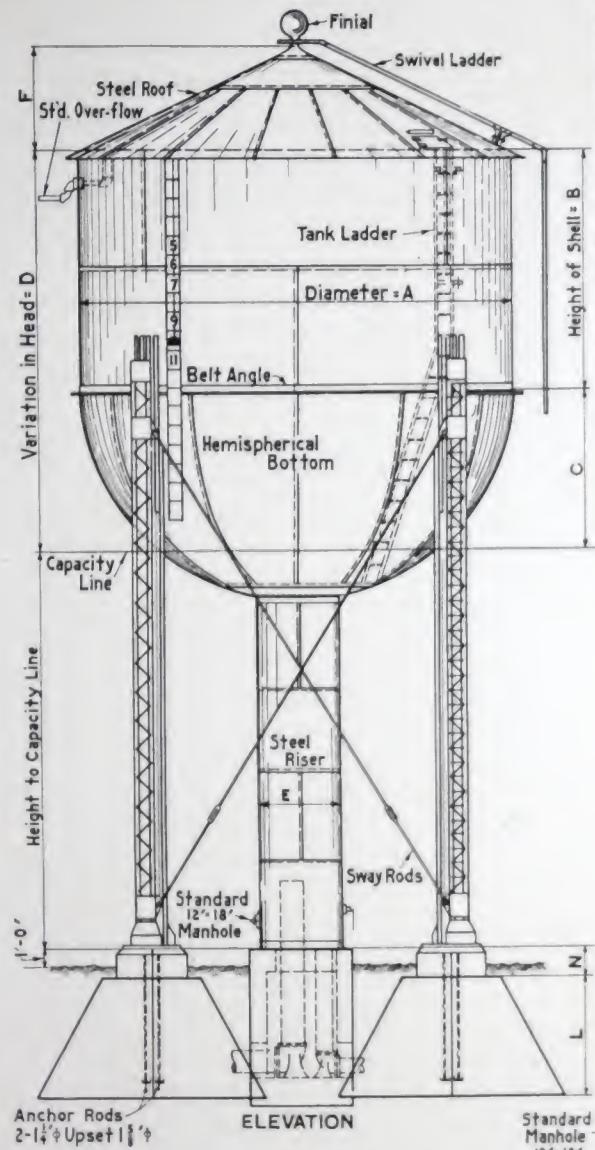
Unless otherwise agreed in contract, sixty per cent of contract price shall be paid on delivery of the steel, twenty per cent when erection has been started, and the balance on completion of the work according to contract. In case the test is delayed for reasons given above the purchaser shall pay all except five per cent of contract price, which amount may be retained until test is made and the work found to be in accordance with contract; provided that if the test is not made within four months from date of completion the balance retained shall be paid, but this shall not release the tower contractor from the conditions of the "Test" above outlined

PERMITS

The builder of the water tower shall furnish such stress sheets and plans as may be necessary to secure building permits and licenses for the erection of the structure. Such building permits and licenses shall be procured by the purchaser at his own expense.

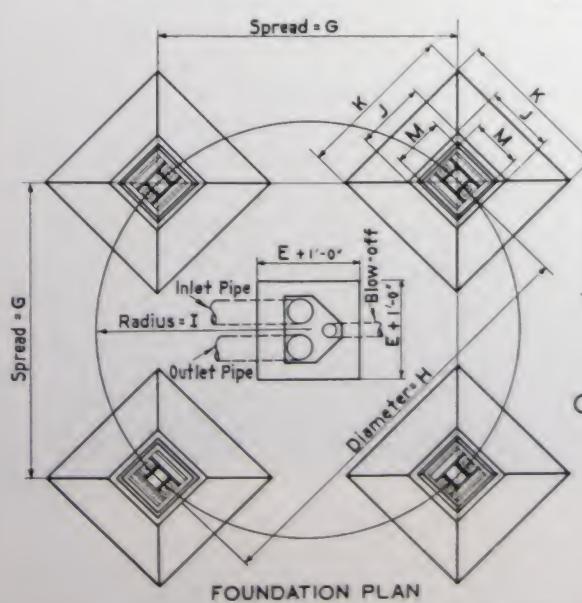
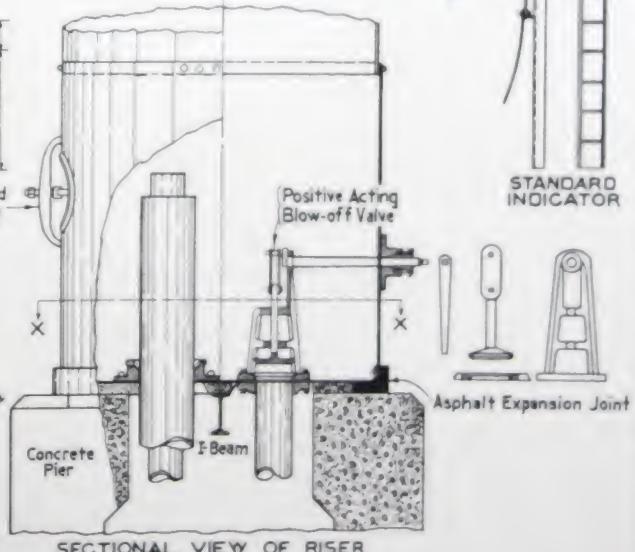
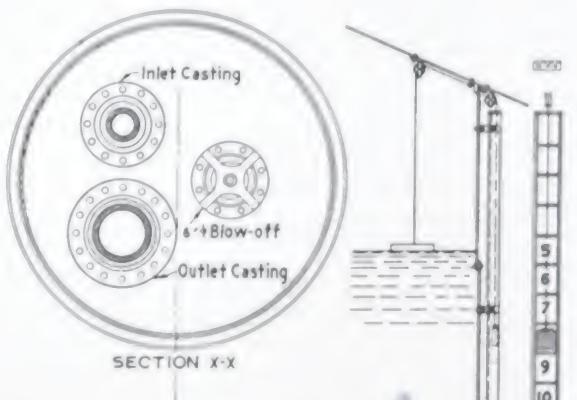
GUARANTEE

Upon completion of the entire work contractor shall, if requested, give the owner a written guarantee for the period of one year agreeing to repair any defects caused by faulty design, materials or workmanship appearing in the structure during this period.



CAPACITY OF TANKS IN IMPERIAL GALLONS										
	20000	25000	30000	35000	40000	50000	60000	75000	80000	100000
A	17'-0"	17'-0"	19'-0"	19'-0"	21'-0"	24'-0"	24'-0"	28'-0"	28'-0"	28'-0"
B	9'-0 5/8"	12'-6 1/8"	11'-8 1/8"	14'-2 1/8"	12'-6 1/8"	10'-0 1/8"	14'-1 1/8"	10'-10 1/8"	12'-6 1/8"	17'-6 1/8"
C	6'-5"	6'-5"	8'-4"	8'-11"	7'-2"	10'-2"	8'-9"	10'-11"	10'-2"	10'-9"
D	15'-6"	19'-0"	18'-1"	21'-2"	19'-9"	20'-3"	22'-11"	21'-10"	22'-9"	28'-6"
E	Riser diameter varies with location of tank and size of piping.									
F	5'-3"	6'-3"	4'-9"	4'-9"	5'-3"	6'-0"	6'-0"	7'-0"	7'-0"	7'-0"
G	12'-3 1/2"	12'-3 1/2"	13'-8"	13'-8"	15'-1"	17'-2 1/2"	17'-2 1/2"	20'-0 1/2"	20'-0 1/2"	20'-0 1/2"
H	17'-4"	17'-4"	19'-9"	19'-9"	21'-4"	24'-4"	24'-4"	28'-4"	28'-4"	28'-4"
I	8'-8"	8'-8"	9'-8"	9'-8"	10'-8"	12'-2"	12'-2"	14'-2"	14'-2"	14'-2"
J,K,L,M,S,N	Varies with size of tank and height to capacity line.									

J,K,L,M,S,N - Varies with size of tank and height to capacity line.



CANADIAN DES MOINES STEEL COMPANY

LIMITED

Engineers Manufacturers Contractors

CHATHAM, ONTARIO

STANDARD RAILWAY SERVICE TANKS

TYPE MILD CLIMATE HEMISPHERICAL BOTTOM

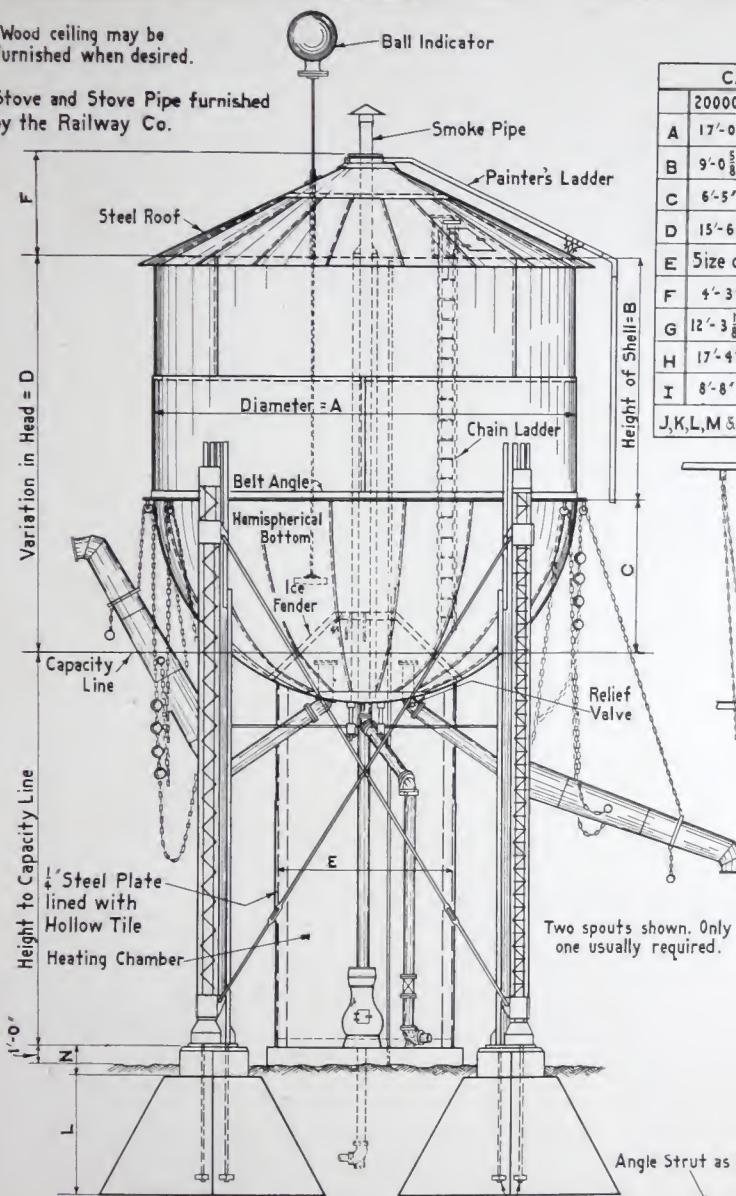
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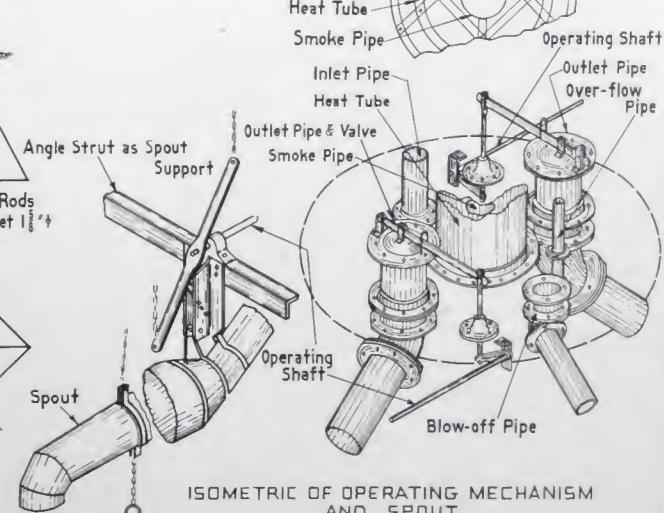
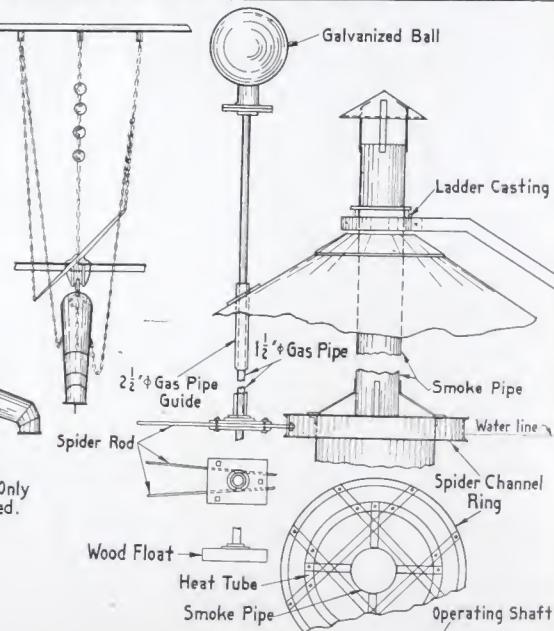
Wood ceiling may be furnished when desired.

Stove and Stove Pipe furnished by the Railway Co.



CAPACITY OF TANKS IN IMPERIAL GALLONS									
20000	25000	30000	35000	40000	50000	60000	75000	80000	100000
A 17'-0"	17'-0"	19'-0"	19'-0"	21'-0"	24'-0"	24'-0"	28'-0"	28'-0"	28'-0"
B 9'-0 ⁵ / ₈	12'-6 ⁵ / ₈	11'-8 ⁵ / ₈	14'-2 ³ / ₈	12'-6 ⁵ / ₈	10'-0 ⁵ / ₈	14'-1 ³ / ₄	10'-10 ⁵ / ₈	12'-6 ⁵ / ₈	17'-6 ³ / ₈
C 6'-5"	6'-5"	6'-4"	6'-11"	7'-2"	10'-2"	8'-9"	10'-11"	10'-2"	10'-9"
D 15'-6"	19'-0"	18'-1"	21'-2"	19'-9"	20'-3"	22'-11"	21'-10"	22'-9"	28'-4"
E Size of heating chamber varies with size of piping and location.									
F 4'-3"	4'-3"	4'-9"	4'-9"	5'-3"	6'-0"	6'-0"	7'-0"	7'-0"	7'-0"
G 12'-3 ¹ / ₈	12'-3 ¹ / ₈	13'-8"	13'-8"	15'-1"	17'-2 ¹ / ₂	17'-2 ¹ / ₂	20'-0 ¹ / ₂	20'-0 ¹ / ₂	20'-0 ¹ / ₂
H 17'-4"	17'-4"	19'-4"	19'-4"	21'-4"	24'-4"	24'-4"	28'-4"	28'-4"	28'-4"
I 8'-8"	8'-8"	9'-8"	9'-8"	10'-8"	12'-2"	12'-2"	14'-2"	14'-2"	14'-2"
J,K,L,M & N - Varies with size of tank and height to capacity line.									

J,K,L,M & N - Varies with size of tank and height to capacity line.



CANADIAN DES MOINES STEEL COMPANY
LIMITED

Engineers - Manufacturers - Contractors

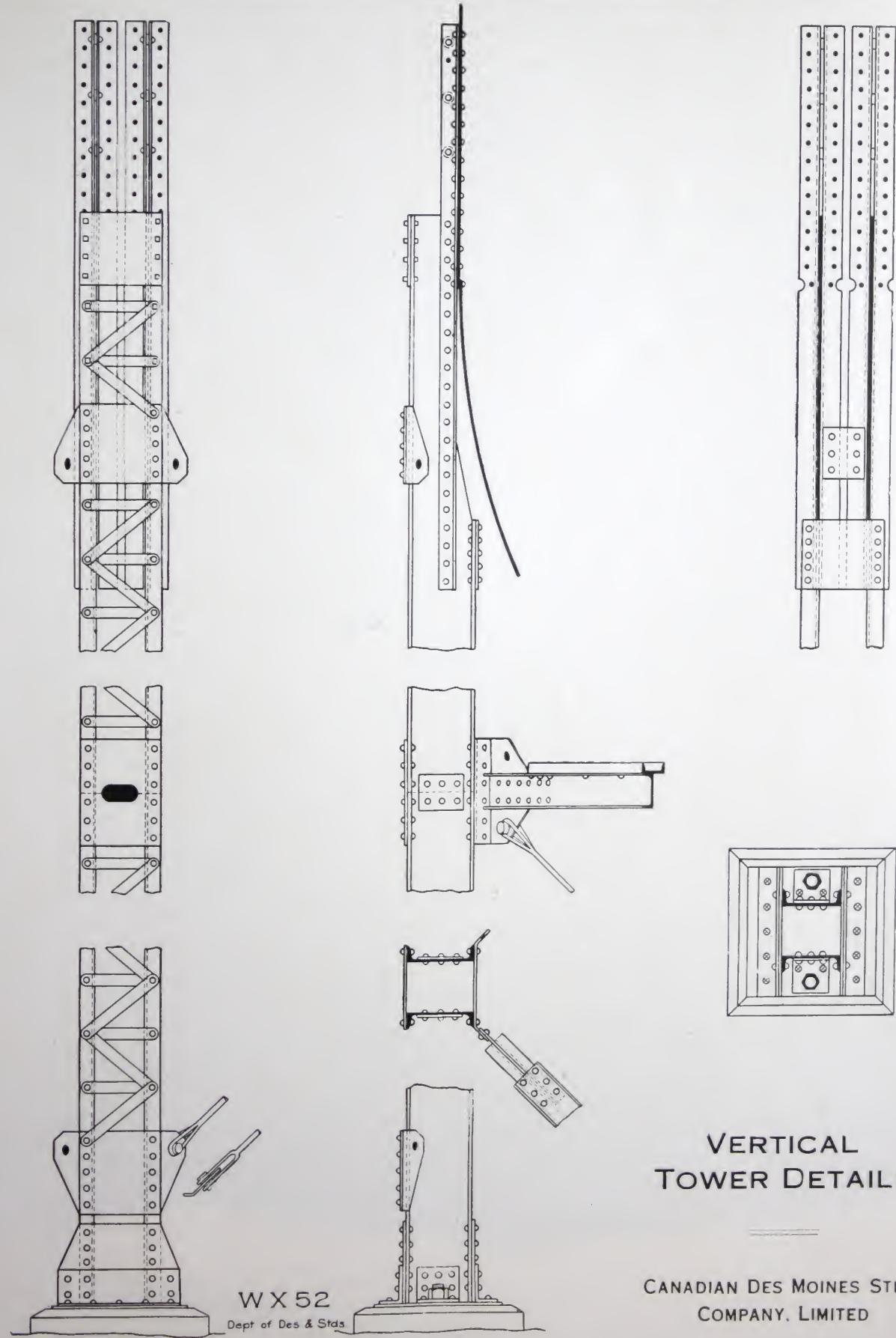
CHATHAM, ONTARIO

STANDARD RAILWAY SERVICE TANKS

TYPE COLD CLIMATE HEMISPHERICAL BOTTOM

W x 74





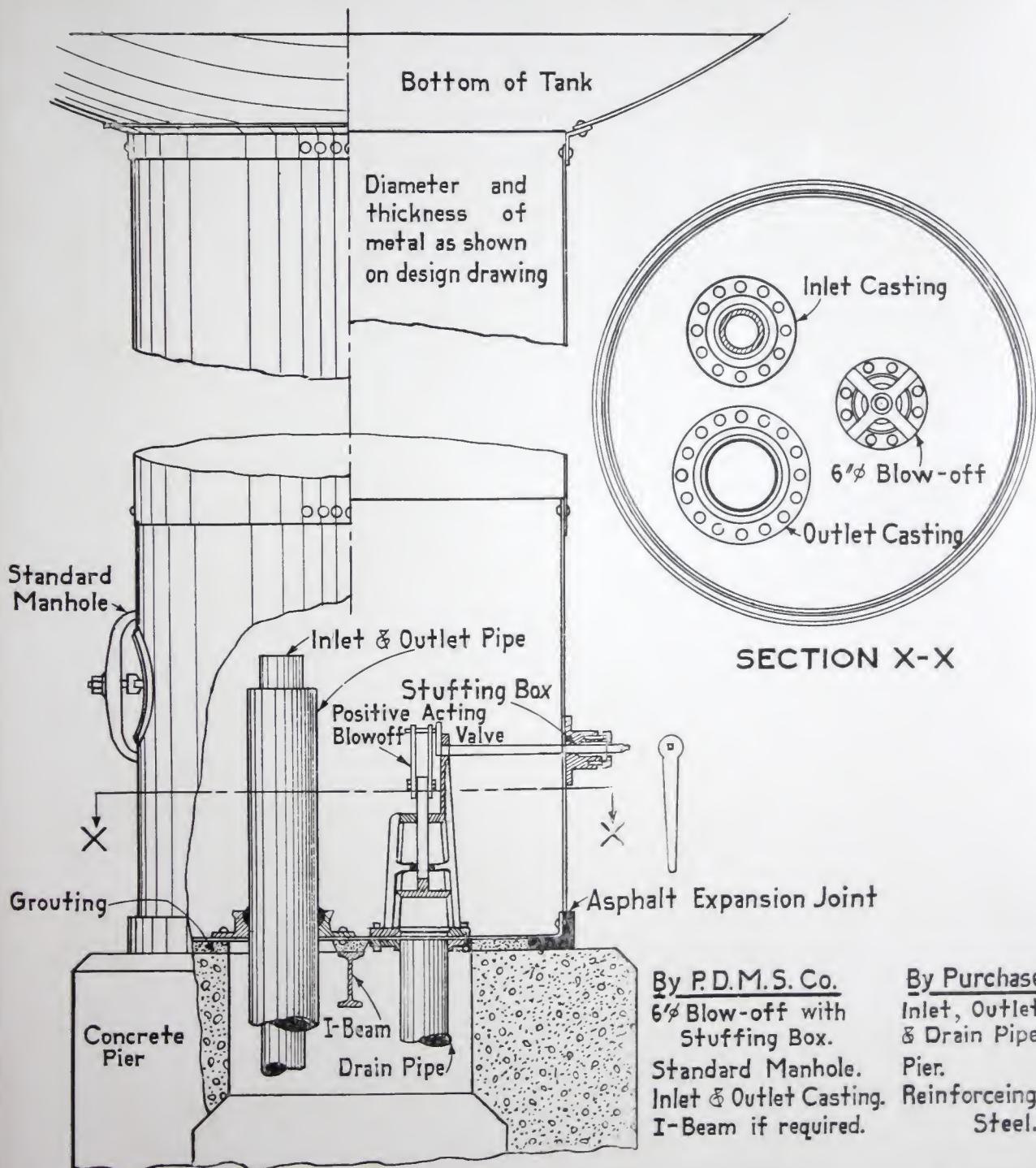
VERTICAL TOWER DETAILS

CANADIAN DES MOINES STEEL
COMPANY, LIMITED

Low Height and Limited Ground Space Make the Vertical Tower Practicable.

St
M

Gr



By P.D.M.S. Co.

6 1/2 Blow-off with
Stuffing Box.

Standard Manhole.

Inlet & Outlet Casting.

I-Beam

By Purchaser

Inlet, Outlet
& Drain Pipe.

Pier.

Reinforcing

Steel.

STANDARD STEEL RISER PIPE FOR RAILROAD WATER TANKS

CANADIAN DES MOINES STEEL COMPANY, LIMITED

W X 68

Expa

Mine

Stee

Build

Air

Hea

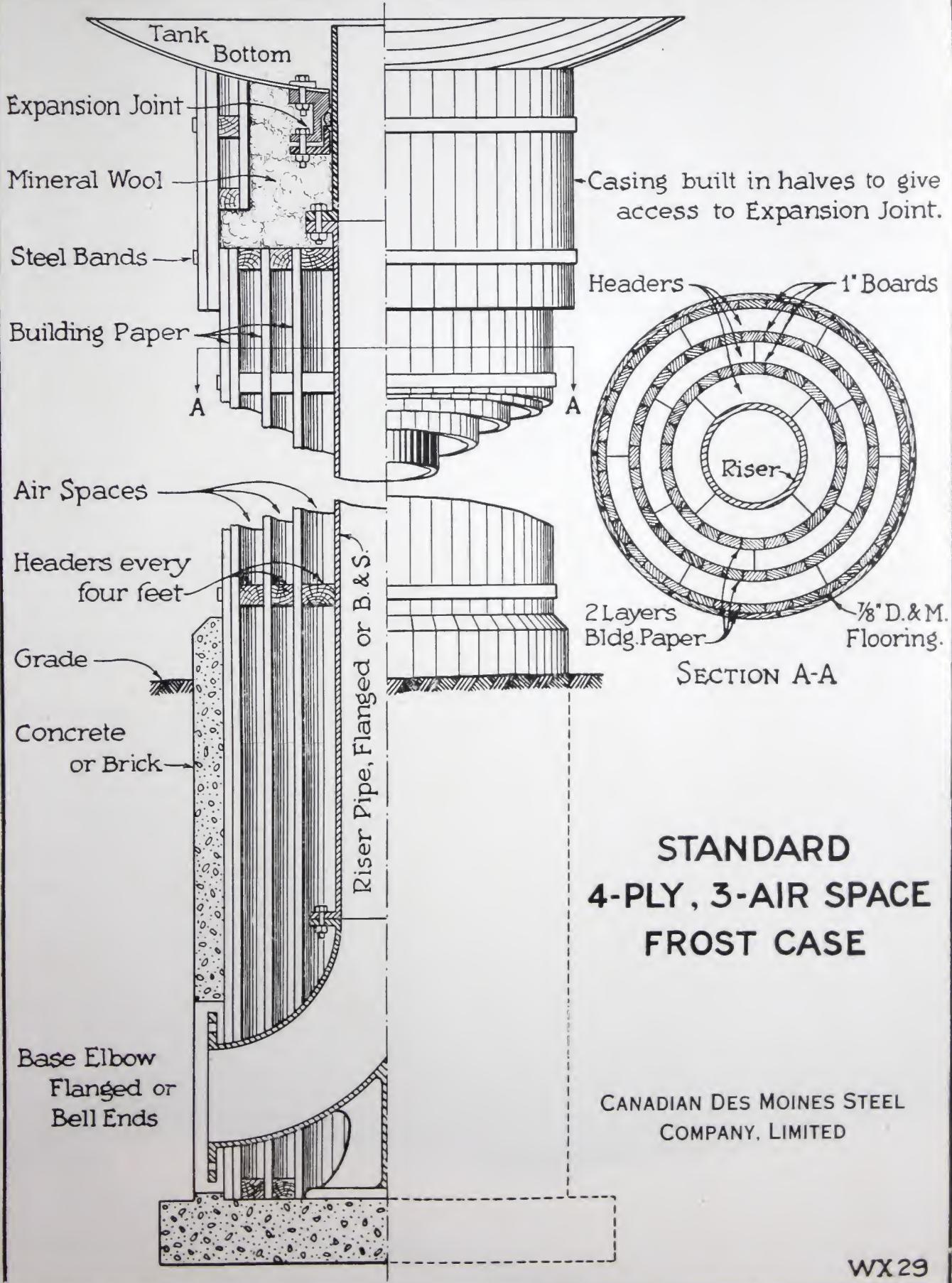
Grac

Con

Bas

F

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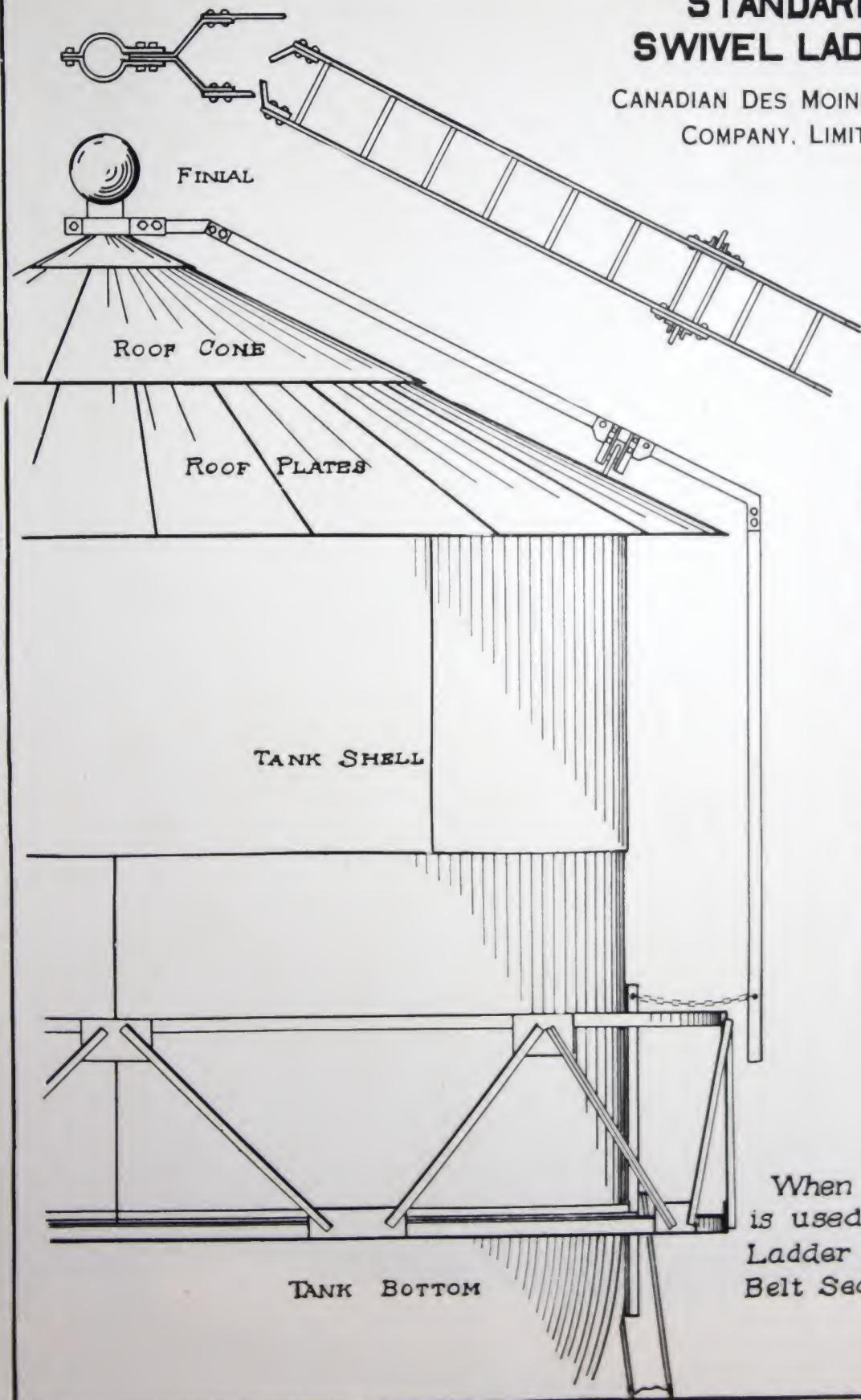
**STANDARD
4-PLY, 3-AIR SPACE
FROST CASE**

CANADIAN DES MOINES STEEL
COMPANY, LIMITED

WX29

STANDARD SWIVEL LADDER

CANADIAN DES MOINES STEEL
COMPANY, LIMITED



When no Balcony
is used Swivel
Ladder extends to
Belt Seam.

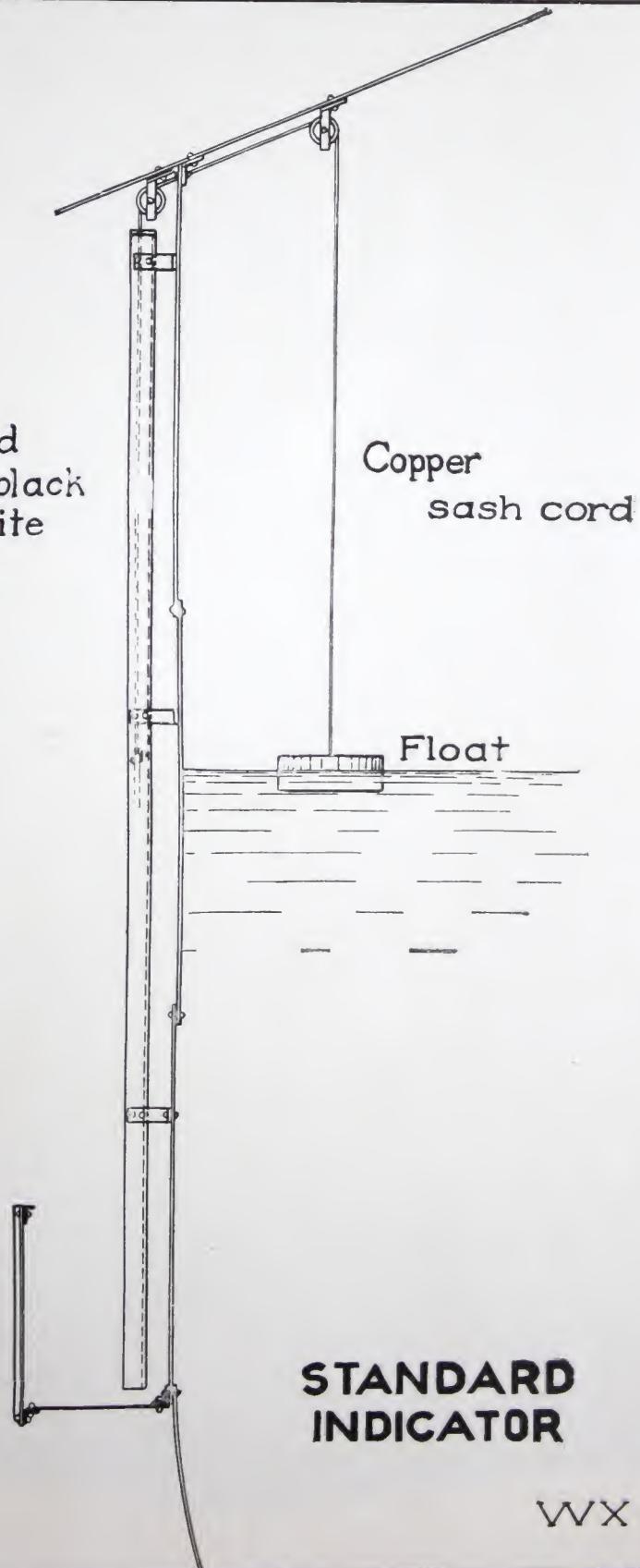
WX. 4

This Feature Makes it Easy to Inspect or Paint Tank Without Erecting Scaffold





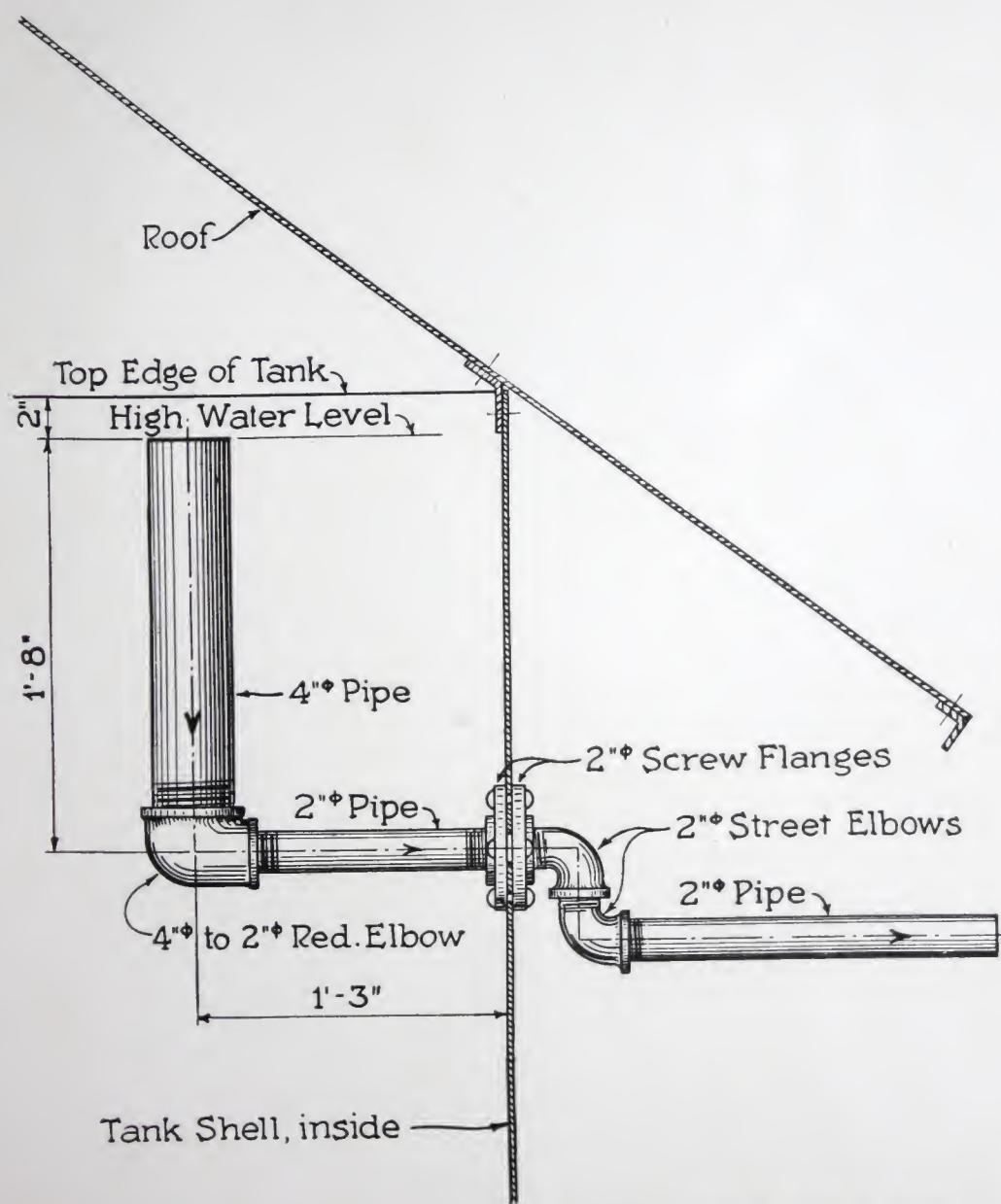
Indicator board
painted with black
figures on white
background.



STANDARD INDICATOR

WX 37

Furnished When Desired in Connection With Canadian Des Moines Tank.



STANDARD OVERFLOW

CANADIAN DES MOINES STEEL
COMPANY, LIMITED

WX 6



How to Use Our Service

THE Canadian Des Moines Steel Company Limited maintains a complete Engineering, Production, Field Erection and Sales Organization at Chatham, Ontario, which is a central location for serving all parts of the Dominion. A letter addressed to our office will put you in touch with our organization. With no obligation on your part one of our engineers will gladly call on you, determine your requirements, design the structure and quote you a price on the work either erected complete or F. O. B. our shops.

If your requirements are determined, mail your inquiry to our office. State clearly your specifications. In the case of a water tower, the following information should be given:

- 1—*Exact location and distance from siding.*
- 2—*Type of structure — Cold-Climate railway tank, Mild-Climate railway service tank or Standard batter-post tower.*
- 3—*Net capacity in Imperial gallons.*
- 4—*The height of the tower to the lowest point of the bottom.*
- 5—*Size of Heat Chamber for Cold-Climate tank or type and size of riser for Mild-Climate tank.*
- 6—*Location of inlet, blow-off and outlet connection—in bottom of riser or with a spout discharging directly from tank.*

A Suggestion

If you are interested in any of our products or if we may be of service to you in furnishing plans and specifications on any of our standard steel structures, mail the enclosed card outlining your requirements.

CANADIAN DES MOINES
STEEL COMPANY
LIMITED

Head Office and Plant
Chatham, Ontario

